

SHORT COMMUNICATION

## Description of the puparium of *Cyphomyia albitarsis* (Diptera: Stratiomyidae: Clitellariinae) from Colombia

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**Abstract.** The puparium of *Cyphomyia albitarsis* (Fabricius, 1805) is described and illustrated for the first time, based on six puparia, of which five emerged into adults. In *Cyphomyia* Wiedemann, 1819, the immature stages (6<sup>th</sup> instar larva or puparia) of only eight species are known (*Cyphomyia aurifrons* Wiedemann, 1830, *C. bicarinata* Williston, 1900, *C. erecta* McFadden, 1969, *C. leucocephala* Wiedemann, 1819, *C. marginata* Loew, 1866, *C. picta* Schiner, 1868, *C. pilosissima* Gerstaecker, 1857, and *C. souzalopesi* Iide, 1967), which represents only 9% of the *Cyphomyia* species described. In addition, some features of the previously known immature stages of the genus are summarized and compared with the puparium of *C. albitarsis*.

**Resumen.** El pupario de *Cyphomyia albitarsis* (Fabricius, 1805) se describe e ilustra por primera vez, basado en seis pupas, de las cuales cinco emergieron como adultos. En *Cyphomyia* Wiedemann, 1819, los estadios inmaduros (6<sup>o</sup> estadio o pupas) de solo ocho especies son conocidas (*Cyphomyia aurifrons* Wiedemann, 1830, *C. bicarinata* Williston, 1900, *C. erecta* McFadden, 1969, *C. leucocephala* Wiedemann, 1819, *C. marginata* Loew, 1866, *C. picta* Schiner, 1868, *C. pilosissima* Gerstaecker, 1857 and *C. souzalopesi* Iide, 1967), los cuales representan solo el 9 % de las especies descritas. En adición, algunas características de los estadios inmaduros previamente conocidos son resumidas y comparadas con el pupario de *C. albitarsis*.

**Key words.** Diptera, Stratiomyomorpha, soldier flies, taxonomy, immature stages, Colombian Western Cordillera, Neotropical Region

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### Introduction

The genus *Cyphomyia* Wiedemann, 1819 belongs to the subfamily Clitellariinae. It is the second largest stratiomyid genus in the Neotropical Region (only behind *Merosargus* Loew, 1805) comprising 73 known species (WOODLEY 2001: 157; 2014), with only two of these species reaching the Nearctic Region. 11 species occur in the other biogeographic regions, except for the Afrotropics (HAUSER et al. 2017: 83; WOODLEY 2001: 157; YANG et al. 2014). An additional species (*Cyphomyia pubiventris* Rondani, 1863) described from South Africa is presumed to be actually from the Neotropics (HAUSER et al. 2017: 83). In the past, the taxonomy of the genus in the Neotropical Region was extensively studied by JAMES (1939, 1940, 1953, 1957) and also MCFADDEN & JAMES (1969), with a key to most species published by JAMES

(1940). These works, unfortunately, are severely outdated. More recently, WOODLEY (2014) revised the Caribbean fauna of *Cyphomyia*, with the description of a new species and a key to the nine species of this region. One new species was described from the Palearctic China by YANG et al. (2014). However, many species still remain undescribed, particularly in the Neotropical Region (WOODLEY 2009).

On the other hand, the biology and morphology of the immature stages of the species of the genus are still little documented. As a result, only eight of a total of 85 species of *Cyphomyia* have 6<sup>th</sup> instar larva or puparium known. *Cyphomyia* larvae are terrestrial and can be recognized mainly by: head large, conical to elongated with a frontal stripe well demarcated, antennae small and two-segmented, eyes prominent with the occurrence of ocular lobes or tu-



bercles behind or below them; thorax with prothoracic lateral spiracles with two slits set on a tubercle; abdomen with inconspicuous spiracles located on each of the first seven segments, the eighth segment with dorsal or subterminal spiracle slit, (puparium with respiratory horns on second to fifth segment as in other Clitelliinae); thoracic and abdominal bristles simple or pubescent arranged distinctively in three longitudinal rows on each side of the medial line (JAMES 1957, MCFADDEN & JAMES 1969). They have been reported to be associated with various types of decaying vegetation such as rotten bark (XEREZ et al. 2004), wounded cactus (MCFADDEN 1967), papaya or cedar (MCFADDEN 1967, MCFADDEN & JAMES 1969). *Cyphomyia marginata* Loew, 1866, was reared from *Carica papaya* in Florida, United States (MCFADDEN 1967). *Cyphomyia souzalopesi* Iide, 1967 was obtained from vegetal resin in Brazil. MCFADDEN & JAMES (1969) collected larvae of *C. bicarinata* Williston, 1900 from rotting papaya logs, MCFADDEN (1967) and also JAMES (1957) reported *C. pilosissima* Gerstaecker, 1857 from *Agave* sp. (maguey) in Mexico.

*Cyphomyia albitarsis* (Fabricius, 1805) is widespread in the Neotropical Region, ranging from Mexico to Brazil and Paraguay. JAMES (1940) summarized most records of the species and included it in his key to the species of the genus, but nothing further has been published about the species. According to his key, adults of both sexes of this species can be recognized by a wing mostly infuscate of brownish except for a longitudinal hyaline area posterior to the discal cell. Adults (Fig. 5) also present head, antennal flagellomeres and legs mostly black (only basitarsus is whitish), dark body, not metallic, with patches of whitish tomentum laterally on the thorax and with three longitudinal stripes of whitish tomentum over the scutum.

Here we describe and illustrate the puparium of *Cyphomyia albitarsis*, based on eight specimens, of which five emerged into adults (two males and three females). The external characters of the newly described puparium are compared with the characters of the other puparia known in *Cyphomyia*. In addition, a lateral habitus photograph of a female adult is provided.

## Materials and methods

Eight last instar larvae of *C. albitarsis* were collected in stem galleries of a fallen trunk of *Carica papaya* L. (Figs 1–2) in the municipality of Anserma, the department of Caldas, Colombia (coordinates 5°14'42.4"N; 75°47'10.7"W). This municipality is located in the Andean West Cordillera at 1700 meters in the Low West, subregion of Caldas. The area is characterized by a terrain of tropical mountain forests with farming areas especially used for cultivation of coffee with mean temperature of 21°C and annual precipitation between 1000–3000 mm (AMAC 2004–2007).

After collection, larvae were transported to the Laboratory of Entomology of the Universidad de Antioquia, Medellín, and placed in a plastic container with the same substrate from where they were collected and with absorbent paper to maintain humidity until the emergence of adults, at room temperature (~25°C, 70% HR). Larvae moved under the folds of absorbent paper and became pupae. The paper was moistened with water daily in between, and the emergency occurred in 34 days. Puparium of each emerged adult was preserved in 96% ethanol along with the adults. The specimens are housed in the Colección Entomológica de la Universidad de Antioquia (CEUA), Medellín, Colombia.

External structures of the puparia were examined using an Olympus SZX7 stereomicroscope, photographed with a Moticam 5.0 system and assembled using the Helicon Focus 6.8.0 software. Photographs of the immature in the field were taken using a Cannon PowerShot SX50 HS camera. Drawings were made using the Adobe Illustrator CC2018 software.

The identification of the adults was performed using a key available in JAMES (1940), and confirmed by comparison with specimens of the reference collection of the Smithsonian Institution (USNM). The morphology and terminology adopted followed JAMES (1981), NERUDOVÁ et al. (2015), PUJOL-LUZ & LEITE (2001), PUJOL-LUZ et al. (2016), ROZKOŠNÝ (1982), ROZKOŠNÝ & KOVAC (1994, 1998), and XEREZ et al. (2004). The following abbreviati-



Figs 1–2. Mature larvae of *Cyphomyia albitarsis* (Fabricius, 1805) on *Carica papaya* L. stem in the field. Photographs © Augusto L. Montoya.

ons were used: (A-I, VIII) abdominal segments 1 to 8; (a) antenna; (Ad) anterodorsal setae; (Ap) apical setae; (as) anterior spiracle; (Asl) anal slit; (Cf) clypeofrontal setae; (D) dorsal setae; (DI) dorsolateral setae; (H) head; (L) lateral setae; (LB) labrum; (Lb) labral setae; (mo) molar area; (mp) maxillary palpus; (P) peritrema; (Ps) posterior spiracle; (ph) pupal respiratory horn; (Sa) subapical setae; (sp) sternal patch; (ss) stigmatic slits; (T-I) prothorax; (T-II) mesothorax; (T-III) metathorax; (V) ventral setae; (VI) ventrolateral setae; (VcR) ventrocraneal sulcus.

## Results

### *Cyphomyia albatarsis* (Fabricius, 1805)

(Figs 1–5)

*Stratiomys albatarsis* Fabricius, 1805: 80. Type locality: “America meridionali.” SYNTYPE: 1 ♀ [The Natural History Museum of Denmark, Copenhagen, Denmark, UZMC] (original description).

*Cyphomyia fenestrata* Macquart, 1846: 48. Type locality: Mexico, Yucatán, Merida Syntypes ♀, ♂ [unknown depository institution] (synonym).

*Stratiomys albatarsis*: WOODLEY (2001: 158, 2011: 410).

**Material examined.** COLOMBIA: Caldas, Anserma, Vereda San Pedro, Finca La Marqueza, trunk of papaya, 1700 m, A. L. Montoya leg. Eight larvae collected on 6.i.2015, five emerged on 9.ii.2015. Puparia and adults: 3 ♀♀ (CEUA-109379, CEUA-109376, CEUA-109377); 2 ♂♂ (CEUA-109378, CEUA-83782); 1 puparium not emerged into adult (CEUA-109375); 2 last instar larvae not emerged into adult (CEUA-83967, CEUA-109381).

**Description. Puparium** (Figs 3–4). Length 14.2–17.0 mm, comprising head (Fig. 3), three thoracic segments (Figs 3–4) and eight abdominal segments (Fig. 4); cuticle brownish, erected dorsal setae mostly pubescent.

**Head** (Fig. 3). Subtriangular, roughly as long as one tenth of entire puparium length, longer than wide. Labrum triangular. Antenna short, rising dorsolaterally in anterior part of head. Eyes prominent, arising in middle of head capsule; lateral setae bipartite at apex; bulbous tubercles posterior to each eye. Mandibular-maxillary complex well

developed; ventrocraneal sulcus evident. Chaetotaxy: 2 pairs of labral setae (Lb), 2 pairs of clypeofrontal setae (Cf), 1 pair of dorsolateral setae (DI), 2 pairs of lateral setae (L) and 3 pairs of ventral setae (V). **Thorax.** Prothorax subrectangular with anterior spiracles prominent; mesothorax and metathorax rectangular with curved side edges. Chaetotaxy: prothorax in dorsal view with 2 pairs of anterodorsal setae (Ad), 3 pairs of dorsal setae (D1) and 1 pair of dorsolateral setae (DI). Ventrally, 1 pair of ventrolateral setae (VI) and 2 pairs of ventral setae (V), one small and simple ( $V_1$ ), and one strong and tripartite ( $V_2$ ) (Fig. 3); mesothorax in dorsal view with 1 pair of anterodorsal setae (Ad), 1 pair of dorsal setae (D) and 1 pair of dorsolateral setae (DI). Ventrally, 1 pair of ventrolateral setae (VI) and 2 pairs of ventral setae (V), one tiny and simple ( $V_1$ ), and one tripartite ( $V_2$ ); metathorax in dorsal view with 2 pairs of anterodorsal setae (Ad), 1 pair of dorsal setae (D), 1 pair of dorsolateral setae (DI) and 1 pair of lateral setae (L). Ventrally, 1 pair of ventrolateral setae (VI) and 2 pairs of ventral setae (V), one small and simple ( $V_1$ ), and one tripartite ( $V_2$ ) (Fig. 4). **Abdomen** (Fig. 4). Pupal respiratory horn well preserved, arising from segments 2–5; segments 1–7 similar in shape. Dorsally with 3 pairs of dorsal setae (D), 1 pair of dorsolateral setae (DI) and 1 pair of conspicuous and long lateral setae (L). Ventrally, with 2 pairs of ventrolateral setae (VI) and 3 pairs of ventral setae (V), with ( $V_1$ ) shorter than ( $V_2$ ) and ( $V_3$ ). Segment 6 with elliptical sternal patch. Segment 8 semicircular in shape, exhibits posterior spiracle dorsally just before apex (Ps); anal slit (Asl) much shorter than segment 8, surrounded by two perianal grooves. Chaetotaxy: dorsally with 1 pair of dorsal setae (D) and 2 pairs of lateral setae (L). Ventrally, 4 pairs of ventral setae (V), 1 pair of subapical setae (Sa) and 1 pair of apical setae (Ap).

**Comments.** As in other described puparia of Stratiomyidae species, the features of the mature larvae are still evident, except for the emerging suture well prominent and the

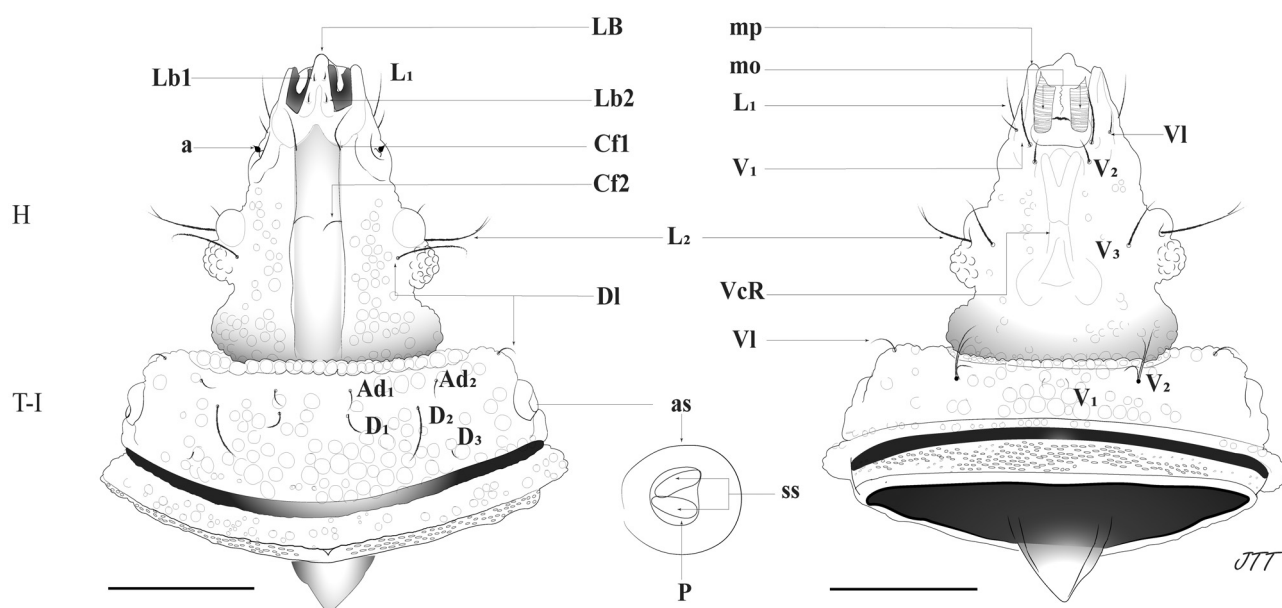


Fig. 3. Puparium of *Cyphomyia albatarsis* (Fabricius, 1805), capsule cephalic and thoracic segment one. Left, dorsal view; right, ventral view. Scale bar = 1 mm.

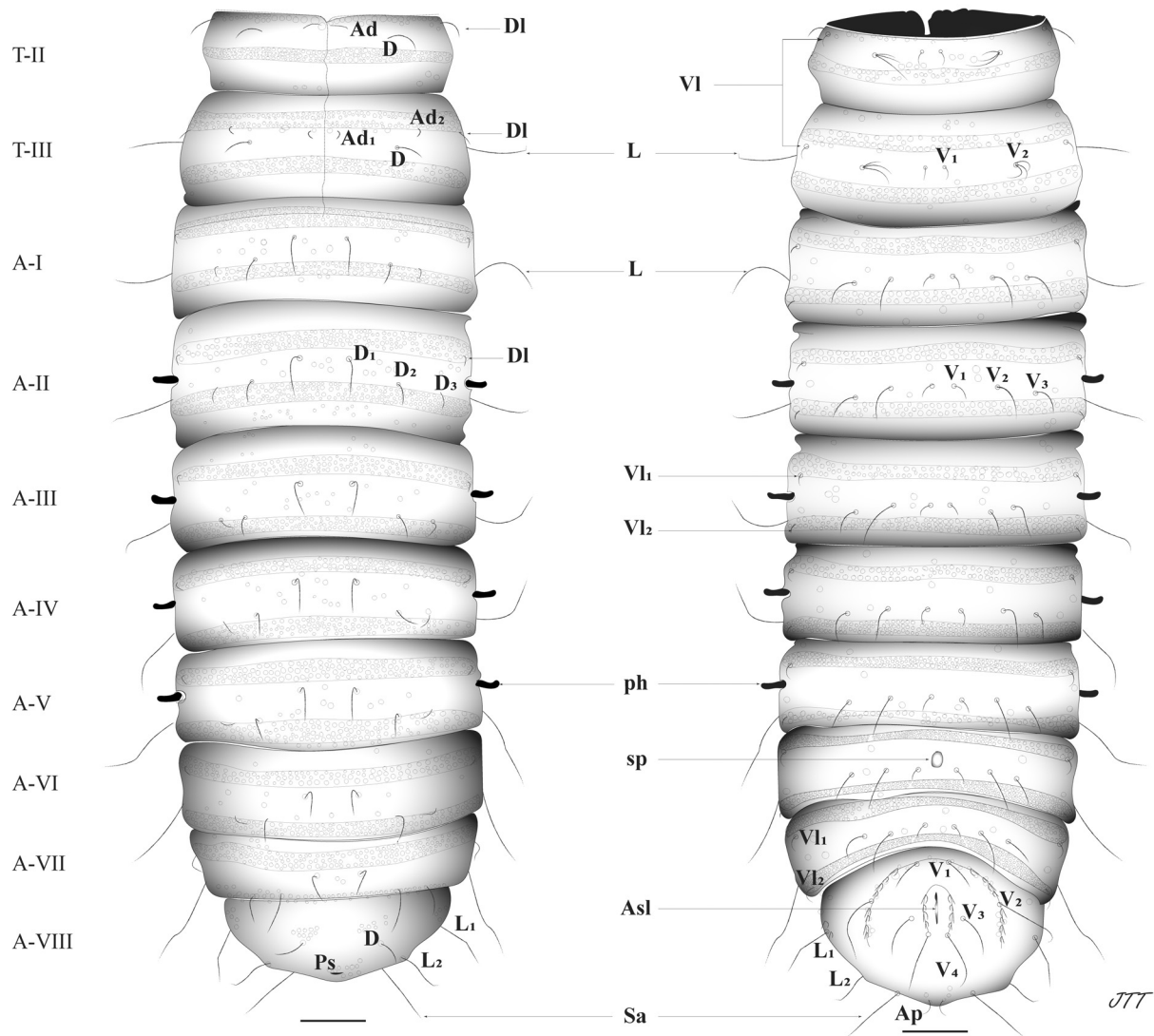


Fig. 4. Puparium of *Cyphomyia albitarsis* (Fabricius, 1805), thoracic segments two and three, and abdominal segments. Left, dorsal view; right, ventral view. Scale bar = 1 mm.



Fig. 5. Adult of *Cyphomyia albitarsis* (Fabricius, 1805) (♀), habitus, lateral view.

Table 1. Comparison between the known immature stages of nine *Cyphomyia* species.

Species	Size (mm)	Head	Thorax	Abdomen	Reference
<i>C. albitarsis</i>	14.2–17.0	Head longer than wide. Ocular region with one bulbous tubercle posterior to each eye.	Prothorax with 3 pairs of dorsal setae (D) and 2 pairs of ventral setae (V). Pro-, meso- and meta-thorax with ventral seta (V <sub>2</sub> ) tripartite. Setation mostly pubescent.	Abdominal segments 1–7 with 1 pair of dorsolateral setae. Arrangement of dorsal setae (D) displaced from the center to the posterior margin. Arrangement of ventral setae (V) almost in the same plane. Setation mostly pubescent.	Present work
<i>C. aurifrons</i>	~16.0	Head short, moderately flat. Posterior area of eyes without tubercles.	Prothorax with 3 pairs of anterodorsal setae (Ad). Pro-, meso- and meta-thorax with ventral setae (V <sub>2</sub> ) tripartite	Abdominal segments 1–7 with 2 pairs of dorsolateral setae (D).	XEREZ et al. (2004)
<i>C. bicarinata</i>	~11.7 excluding head and prothorax	Head longer than wide. Ocular tubercles presumably absent.	Prothorax with 1 pair of dorsolateral setae (Dl), 2 pairs of anterodorsal setae and 2 pairs of dorsal setae (D).	Abdominal segment 1 with 2 pairs of dorsal setae (D), the inner longer than the outer seta. Abdominal segment 8 with 1 pair of dorsal setae (D), 2 pairs of lateral setae (L) and 1 pair of apical setae (Ap).	MCFADDEN & JAMES (1969)
<i>C. erecta</i>	~13.3 excluding head and prothorax	Head longer than wide. Ocular tubercles presumably present anteriorly and posteriorly of each eye.	Prothorax with 1 pair of dorsolateral setae (Dl) and 3 pairs of dorsal setae (D), dorsal integument with small, dark transverse plates arranged in linear pattern near lateral margin.	Abdominal segment 1 with 2 pairs of dorsal setae (D) of similar length. Abdominal segment 8 with 1 pair of dorsal setae (D), 1 pair of lateral setae (L) and one pair of apical setae (Ap).	MCFADDEN & JAMES (1969)
<i>C. leucocephala</i>	~14.0	Head longer than wide. Ocular region with one bulbous tubercle, immediately posterior each eye.	Prothorax with ventral setae (V) bipartite.	Abdominal segments 1–7 with 3 pairs of dorsal setae (D) and 2 pairs of dorsolateral setae (Dl); ventrally, 3 pairs of ventral setae (V) and 2 pairs of ventrolateral setae (Vl).	IIDE (1963); XEREZ et al. (2004)
<i>C. marginata</i>	~20.1	Head longer than wide.	Not mentioned.	Abdominal segment 1 with 3 pairs of dorsal setae (D), decreasing in length towards the most distal one. Abdominal segment 8 with long anal slit (As) ventrally, 2 pairs of lateral setae (L), 4 pairs of ventral setae (V) and 2 pairs apical setae (Ap).	MCFADDEN (1967); XEREZ et al. (2004)
<i>C. picta</i>	~15.0	Head elongated and projected forward. Posterior area of eyes without tubercles.	Prothorax with 3 pairs of anterodorsal setae (Ad). Pro-, meso- and meta-thorax with ventral setae (V <sub>2</sub> ) tripartite.	Abdominal segments 1–7 with 2 pairs of dorsolateral setae (Dl).	XEREZ et al. (2004)
<i>C. pilosissima</i>	~18.0	Head short, only slightly longer than wide. Ocular area with two bulbous tubercles posteriorly of each eye.	Prothorax with 2 pairs of anterodorsal setae (Ad) and 2 pairs of dorsal setae (D).	Segments 1–7 with 1 pair of dorsolateral setae (Dl).	JAMES (1957)
<i>C. souzalopesi</i>	8.5–16.5	Head longer than wide, ocular region without tubercles	Setation densely plumose.		IIDE (1967)

presence of pupal respiratory horns. Only in one puparium, some of the horns did not reach full length.

The body shape, mosaic appearance of integument and general chaetotaxy present in *Cyphomyia albitarsis* described here are similar to the other species, but some marked differences were observed. The arrangement of setae on the prothorax of *C. albitarsis* differs from *C. aurifrons* and

*C. picta* in the number of anterodorsal setae, with 2 pairs in *C. albitarsis* and 3 pairs in the other two. *C. pilosissima* differs in having 2 bulbous tubercles behind each eye and prothorax with only 2 pairs of dorsal setae. Some setae in *C. albitarsis* have a brushy appearance, being sometimes bipartite at apex or tripartite in the entire length, and pubescent, although they never show a plume-like appearance.

rance as seen in *C. souzalopesi* described by IIDE (1967). Additional external features are compared with the other known species of the genus in Table 1.

**Distribution.** Neotropical: Bolivia, Brazil, Colombia, Costa Rica, Ecuador, Guyana, Honduras, Mexico, Panama, Paraguay, Peru, Trinidad, Venezuela (WOODLEY 2001:158).

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